

Turkey in SESAME & SESAME in Turkey: a “Physics Matters” Relationship

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Outline

SESAME

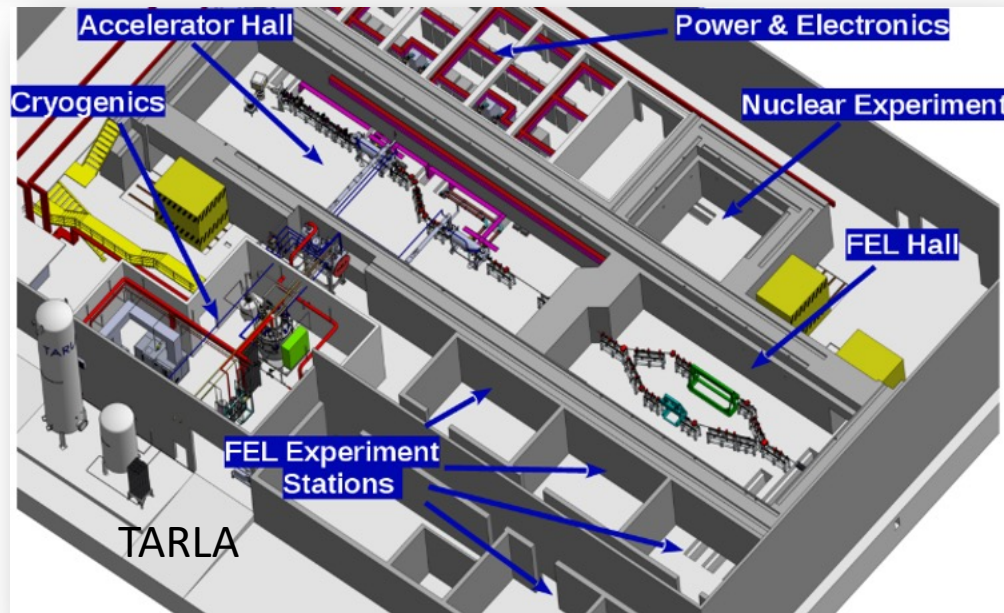


Turkish science and technology policy making;
roles of TÜBİTAK and TENMAK.

Turkey-SESAME relations.

Effects of SESAME on different aspects of
science activities in Turkey.

Lessons learned.



The Scientific and Technological Research Institution of Turkey (TÜBİTAK)



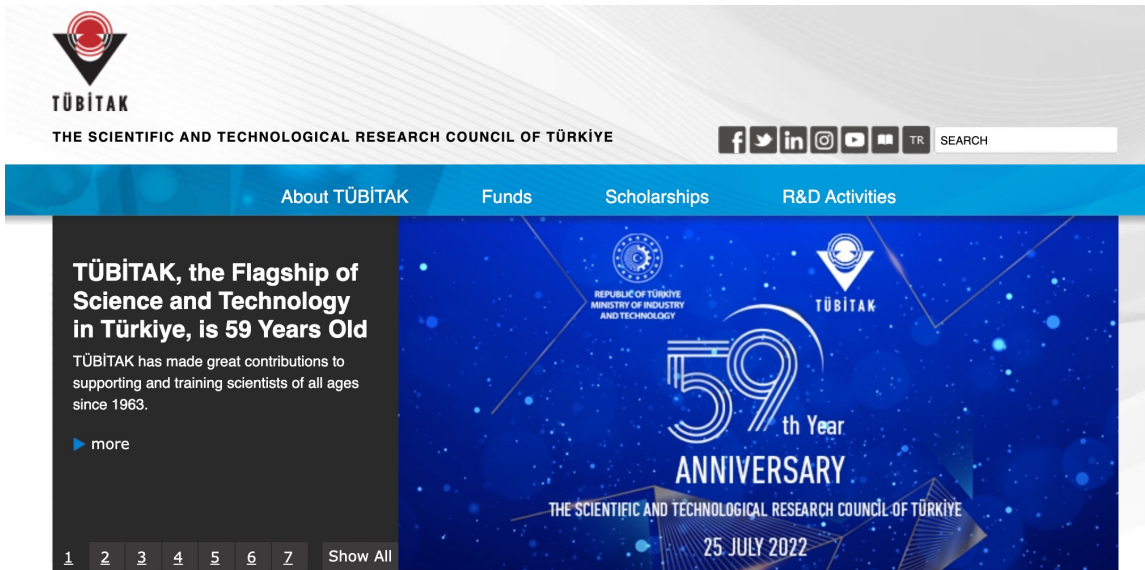
TÜBİTAK, The Scientific and Technological Research Institution of Turkey, established in 1963. New era of planned economy, first 5-year development plan).

Initially responsible to the Prime Minister. Now to Ministry of Industry and technology.

Its goals are:

- develop science, technology and innovation" (STI) policies according to national targets and priorities,
- support and conduct research and development,
- play a leading role in the creation of a science and technology culture in the country.

TÜBİTAK The Scientific and Technological Research Institution of Turkey



More than 2,500 researchers work at the 15 different research institutes and research centers attached to TÜBİTAK.
Both contract-based and targeted nationwide research.

TÜBİTAK mediates in international research efforts, e.g., memberships in European Science Foundation and the EU Framework Programmes for Research and Technological Development.

Annual budget of TÜBİTAK: 3.2 Billion TL

Annual Budget of Turkey: 1.750 Trillion TL → 0.18%

R&D as percent of GDP 1.1%

[https://data.tuik.gov.tr/Bulten/Index?p=37448&dil=2#:~:text=TRKSTAT%20Corporate&text=Central%20government%20budget%20outlays%20on%20Research%20and%20Development%20\(R%26D\)%20activities,48%20billion%20TRY%20in%202020.](https://data.tuik.gov.tr/Bulten/Index?p=37448&dil=2#:~:text=TRKSTAT%20Corporate&text=Central%20government%20budget%20outlays%20on%20Research%20and%20Development%20(R%26D)%20activities,48%20billion%20TRY%20in%202020.)

Science, Technology and Innovation Policy Studies

Policies

TÜBİTAK Call Plan

Bilgi ve İletişim Teknolojileri	Enerji
Tarım ve Gıda	Makine İmalat
Otomotiv	Sağlık
Sosyal ve Beşerî Bilimler	Diğer Alanlar

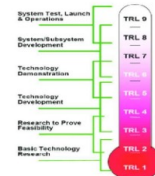
Technology Roadmaps and Prioritization



TÜBİTAK Support Mechanisms Design and Evaluation



Output and Technology Readiness Level Analysis of Support Mechanisms



Competency Mapping and Analysis



Index Studies



Contribution to National Policy Documents



International Delegation and Contribution



The figure shows extract of current STI policy studies.

From the right menu related information which is published can be seen.

The figure is designed by TÜBİTAK STI Policies Department.

TÜBİTAK Call Plan

Information and Communication
Technologies

Agriculture and Food
Technologies

Automotive
Technologies

Social Sciences and Humanities

Energy

Machine Manufacturing

Health

Other Fields

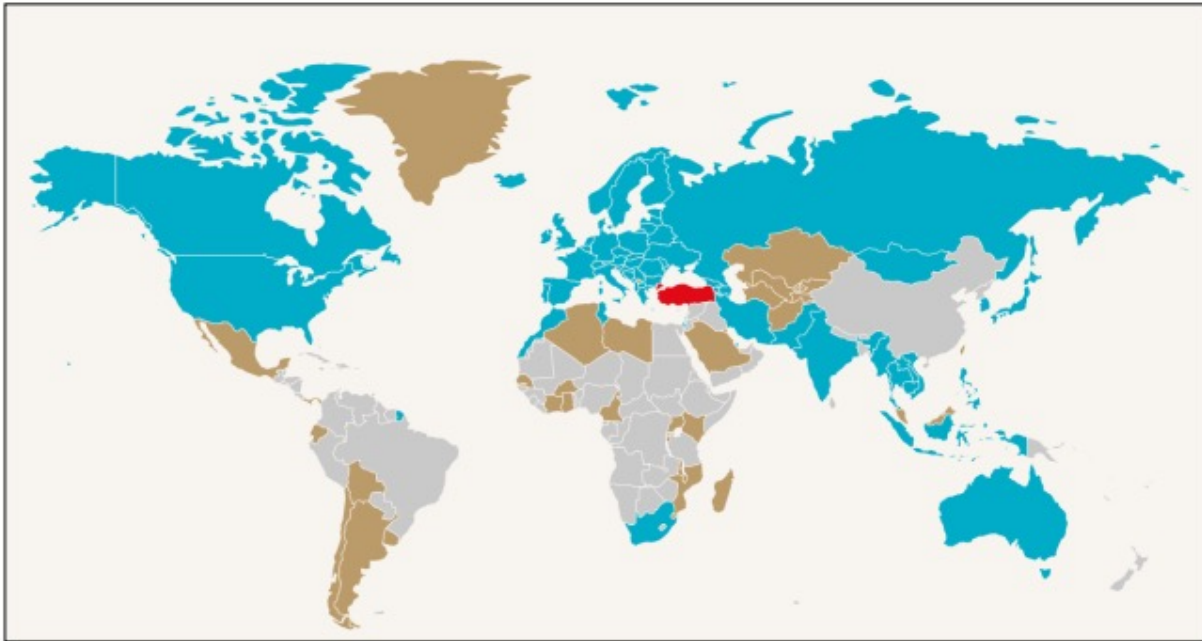
Under these areas “priority technology” areas are listed.

Technology biased.

Diverse instruments for funding.

Scarce Collaborations in the Middle East

Bilateral Programs



Blue: open bilateral program calls
Brown: bilateral programs not open
Gray: no cooperation programs

91 Institutions in 64 countries.
Possibility for cooperation with more than 100 countries through multi-partner platforms.
34 bilateral and 22 multi-partner calls were announced in 2021

Less than 10 out of 64 are with Middle Eastern countries.

TENMAK Turkish Energy, Nuclear and Mineral Research Agency



www.tenmak.gov.tr

TÜRKÇE

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Established in 2022, TENMAK is the re-organized form of TAEK, Turkish Atomic Energy Authority, now housing the National Boron Research Institute, Rare Earth Elements Research Institute which were affiliated to the Ministry of Energy and Natural Resources and as the Agency, the following institutes

TENMAK carries out its activities in the fields of energy, mining, ionizing radiation, particle accelerators and nuclear technology.



TENMAK Support for SESAME Activities in Türkiye

The need for SESAME facilities by Turkish scientists was established through a survey conducted in more than 20 universities.

In 2014 a programme for funding SESAME users' travel expenses (and if necessary to other synchrotrons) was created.



APS, Physics Matters, 23. 08. 2022



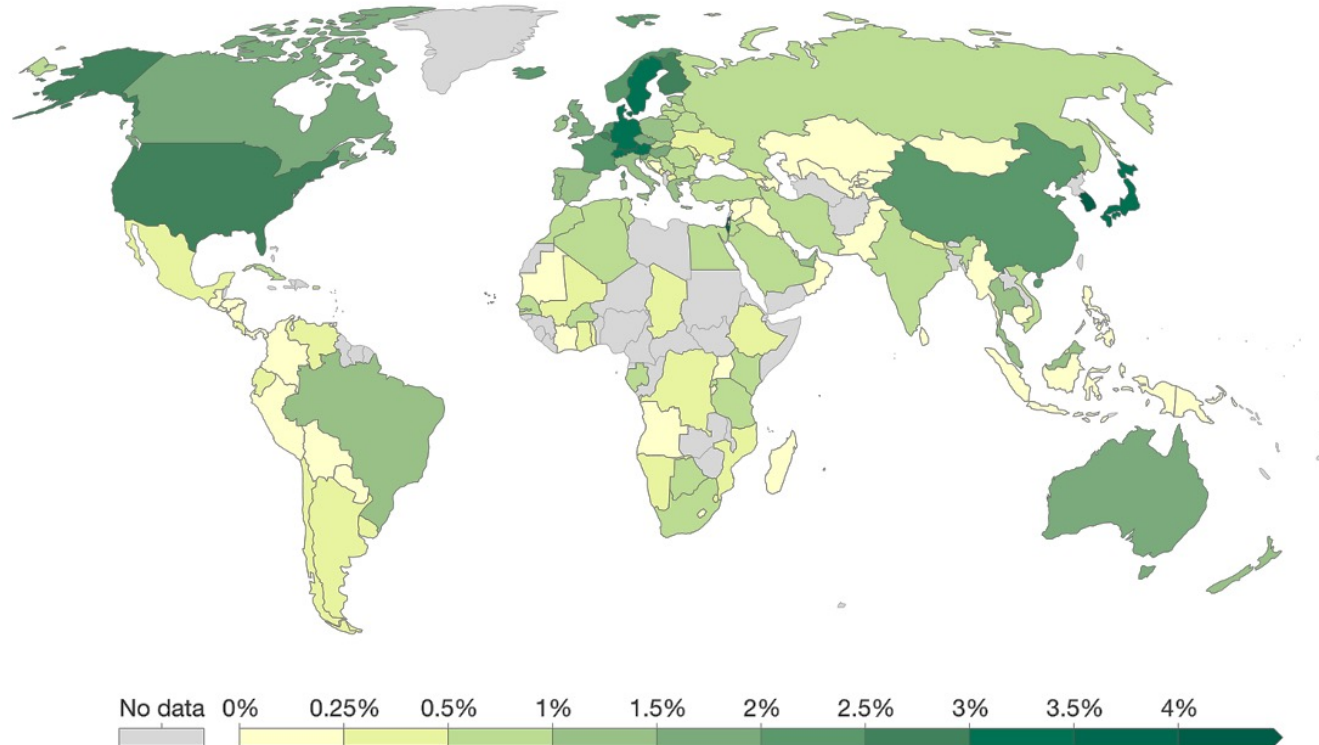
SESAME Users Meeting,
December 2021, in Ankara

A Global Comparison of Research Funding

Spending on research and development as share of GDP, 2019

Our World
in Data

Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.



Source: UNESCO (via World Bank)

CC BY

A synchrotron for the Middle East: SESAME

Synchrotron-light for Experimental Science and Applications in the Middle East (www.sesame.org.jo)



A major international research laboratory and the only Synchrotron Radiation (SR) source in the Middle East.

Modelled after CERN.

SESAME's mission:

- Conduct world class science and technology in the Middle East and neighboring countries in fields including biology and medical sciences, materials science, chemistry, physics, archaeology, arts.
- Contribute to reverse brain drain in the region.
- Participate in developing high technology infrastructure in the region.
- Establish cooperation across cultural and political divides.

SESAME: Members, Observers & Structure



Observers: Brazil, Canada, CERN, China, EU, France, Germany, Greece, Italy, Japan, Kuwait, Portugal, Russian Federation, Spain, Sweden, Switzerland, UK, USA.

Council:

Delegates from member countries and observers.

Advisory committees:

Machine, Science and Finance

Proposal Evaluation.

Directorate:

Director, Scientific, Technical and Administrative.

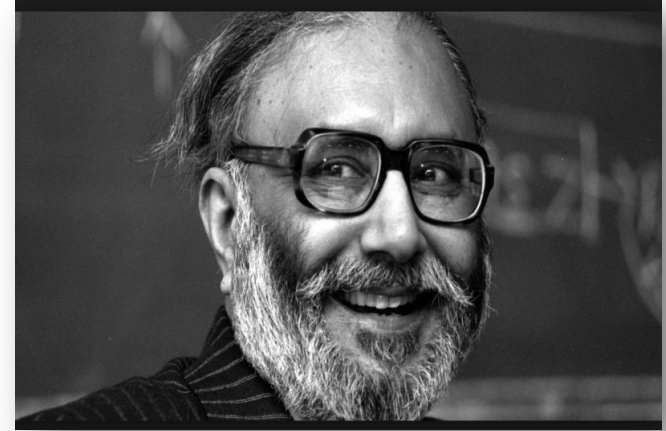
Total Staff: ca. 70 people.

Budget: ~ 5.2 M USD.

Preludes to SESAME 1990-1997

Abdus Salam

A true visionary and great scientist Founder of the International Centre for Theoretical Physics in Trieste. The 1st Muslim to win a Nobel Prize. He suggested in early 1990s that it would be useful to have an SR lab in the Middle East.



1995 meeting in Dahab (Egypt)

Venice Gouda (Egyptian Minister of Education) and Eliezer Rabinovici (CERN) took an official stand in favour of Arab-Israeli Cooperation.

Middle Eastern scientists at CERN prepared the ground for collaborations in the Middle East.



A very brief history of SESAME

1997 – donation of the 0.8 GeV Berlin Synchrotron (BESSY 1) to the Middle East, as basis for a new international organization, modelled on CERN.

1999 - (Interim) Council and international advisory committees established. Training programs have started.

2002- Decision to build a NEW 2.5 GeV storage ring (still using BESSY 1 booster).

2003- Groundbreaking for SESAME building (2008 completion).

2016- Commissioning of the new 2.5 GeV ring.

2017- Opening by HM King Abdullah II, Director General of UNESCO and international guests (May).

Start of friendly user operation (November).



SESAME-Türkiye Relations; Institutionalization

Participation from the early days in the **institutional development**

Turkey was a member of the Interim Council (IC) and was among the countries volunteering to host the facility.



H. Winick (200) SRN 1312, U.S. Department of Energy
Pictured are four of the participants at the meeting of the SESAME Interim Council at UNESCO headquarters. From left to right, they are Ercan Alp (APS and cochair of the SESAME Scientific Committee), Kemalettin Eruygur (the first secretary of the permanent delegation of Turkey to UNESCO), Dincer Ulku (ex-President of the Turkish Research Council, TÜBİTAK), and Namik Kemal Pak (President of TÜBİTAK).

High level interest/representation in SESAME: D. Ülkü, The first vice-chair of the SESAME IC (1999) and later the SESAME Council (2004).

President of TÜBİTAK (1997-1999)

TENMAK (TAEK) is the institution responsible for membership payments.
As well as 1 M \$ voluntary contribution for 5 years (2011).



40th SESAME Council 26-27 June 2022 in Ankara

SESAME-Turkiye Relations; Science Programme

Steering development of **SESAME science** through participation in advisory committees.

H. Winick (2000) SRN 13(4), 25-27



A Turkish scientist, E. Alp co-chaired, with H. Winick the Scientific Advisory committee (SAC).



Z. Sayers chair of SAC 2002-2018
E. Alp chair of SAC 2018-

SESAME-Turkiye Relations; Science Programme

Participation in the development of SESAME science programme through involvement workshops



1st Structural Molecular Biology meeting
Athens (April 2000)

Seven programs:

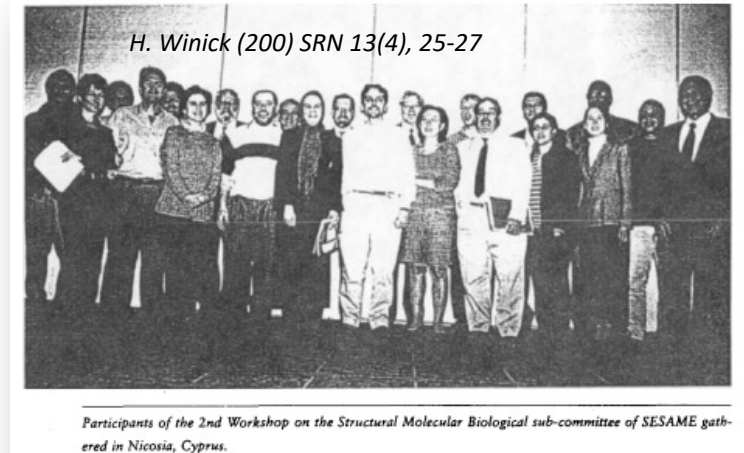
Powder Diffraction (E. Ozdas -Turkey);
Structural Molecular Biology (G. Kryger-
Israel); EXAFS (I. Sagi-Israel); LIGX (A. El-
Nadi-Egypt); X-ray Microscopy (C.
Christophides-Cyprus); **XPS (S.Suzer-
Turkey);** Infra-red (A. Tadjeddine-
FrancelAlgeria).



SESAME Workshop on Materials
research

Ankara (September 2000)

(1) Assessment of the present level of
activity in materials research in
SESAME member countries. (2) to
define the beam lines, user support
facilities, and scientific an



2nd Structural Molecular Biology
Cyprus (December 2000)

(1) Exploring collaborations among
SMB scientists in the region.
(2) Organization of a bioinformatics
and SMB workshop.

SESAME-Turkiye Relations; User Community

Participation in building the **SESAME** user community



SESAME-Sabanci University
Bioinformatics and structural biology
workshop
Istanbul (September 2001)



SESAME 3rd Users meeting
Antalya (October 2004)
7 Beamlines were decided.
XAS, IR, PD, MX, XPES, EUV, SAXS, VUV.

Critical turning point for the users community



SESAME-JSPS-KEK-Sabanci University
workshop
Antalya (March 2010)

Training users community in SR
techniques.

Turkish Scientists in SESAME Committees



Ercan Alp

Zehra Sayers

SAC
Institutionalization and shaping of the science
programme.

Providing expertise and helping to build the user
community.



Engin Özdas

Beamlines Com.
ex-member



Emrah Özensoy

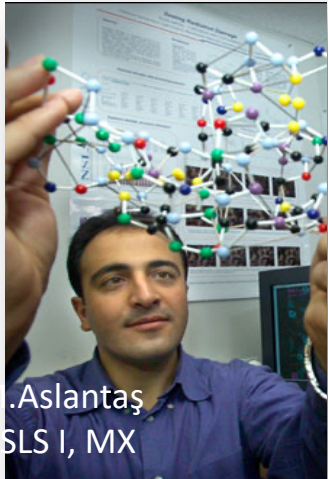
SESAME SAC member



Özgül Öztürk

Chair, Users' committee

Turkish Students



.Aslantaş
SLS I, MX

Receiving training being supported through SESAME funds. (2004-2017)



G. Çakmak
NSLSI, IR



F. Aksoy
ALS, XAS

Ö. Özgen & Y. Özcan, Taiwan

Ö. Seçkin, Elettra

A. Hamdi, APS

A. Akkaya, SLS

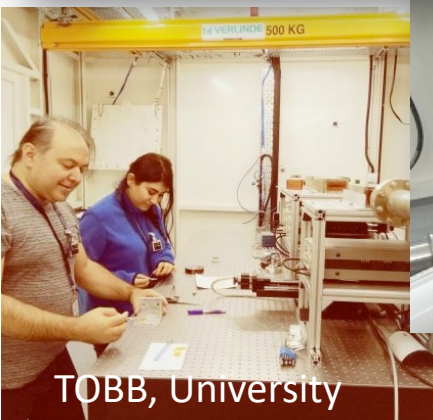
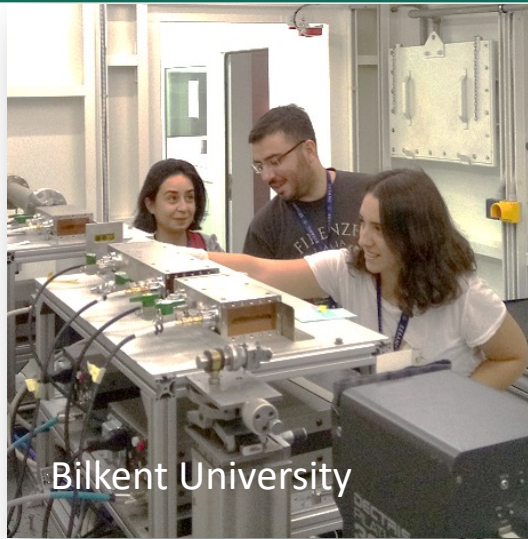
....



M. Konar, S. Soydan, E. Caferoğlu
SESAME, HESEB

Internship training at SESAME supported through EU funds. (2020-)

Effects on Access to SR Based Science in Türkiye

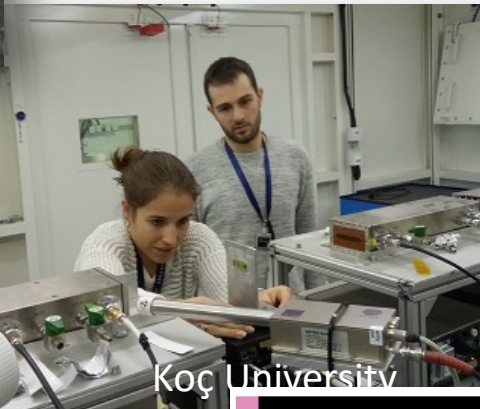


During 2017-2022
17 publications (out of 51 from
SESAME)

materialstoday
COMMUNICATIONS
Volume 31, June 2022, 103571

Electronic and crystal structure analyses of boron doped LiFeO_2 cathode material by the XAFS spectroscopy

Selen Gunaydin ^a, Messaoud Harfouche ^b, O. Murat Ozkendir ^{a, c, d, e}



Applied Catalysis B: Environmental
Volume 256, 5 November 2019, 117808

Exceptionally active and stable catalysts for CO_2 reforming of glycerol to syngas

Selin Bac ^a, Zafer Say ^{b, c}, Yusuf Kocak ^b, Kerem E. Ercan ^b, Messaoud Harfouche ^d, Emrah Ozer ^e, Ahmet K. Avci ^{a, d, e}

ChemPlusChem
A Multidisciplinary Journal Centering on Chemistry

Chemistry
Europe
European Chemical
Societies Publishing

Full Paper

Lytotropic Liquid Crystalline Mesophases Made of Salt-Acid-Surfactant Systems for the Synthesis of Novel Mesoporous Lithium Metal Phosphates

İşıl Uzunok, Dr. Jeonghun Kim, Tuluhan O. Çolak, Dr. Dae Sik Kim, Prof. Hansu Kim, Minjun Kim, Yusuke Yamauchi, Prof. Ömer Dag ^{a, b, c, d, e} See fewer authors

First published: 28 August 2019 | <https://doi.org/10.1002/cplu.201900435> | Citations: 2

Some examples of TR publications

Issue 10, 2022

[Previous Article](#) | [Next Article](#)



From the journal:
Sustainable Energy & Fuels

Ag/AgCl clusters derived from AgCu alloy nanoparticles as electrocatalysts for the oxygen reduction

Timuçin Balkan ^{a, b, c, d, e}, Hüseyin Küçükkeçeci ^{a, b, c, d, e}, Metin ^{a, b, c, d, e} and Sarp Kaya ^{a, b, c, d, e}

Check for updates



Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy
Volume 274, 5 June 2022, 121026



Synchrotron Radiation Fourier Transform Infrared (SR-FTIR) spectroscopy in exploring ancient human hair from Roman period Juliopolis: Preservation status and alterations of organic compounds

K.O. Lorentz ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, G. Kamel ^{b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, S.A.M. Lemmers ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Y. Miyauchi ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, E. Çubukçu ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, A. Alpogut ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, A.M. Büyükkarakaya ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}



Jour

Phenomena

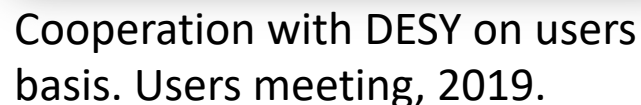
Volume 235, August 2019, Pages 23-28



Boron activity in the inactive Li_2MnO_3 cathode material

O. Murat Ozkendir ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Messaoud Harfouche ^{b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Intikhab Ulfat ^{c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Çiğdem Kaya ^{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Gultekin Celik ^{d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Sule Ates ^{d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Sevda Aktas ^{d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Hadi Bavegar ^{d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, Tugba Colak ^{e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}

Increased familiarity and motivation SR experiments



Turkish BAG (Block Allocation Group)

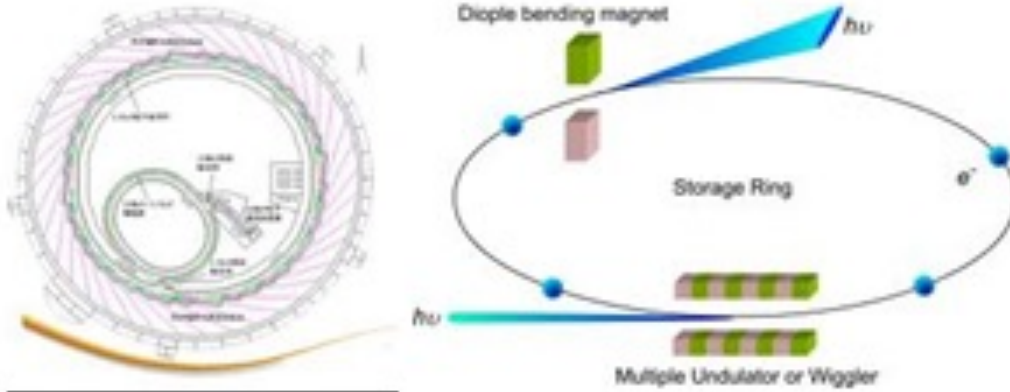
Experiments @EMBLp12 beamline on
PETRAIII
DESY, Hamburg since 2018.

Sabancı University, İzmirAdvanced
Technology Institute, İzmir Biomedical and
Genome Center, Yeditepe University, Ege
University.



Effects on Turkish Science in Accelerator Physics and Light Sources

Turkish Accelerator Center Project: Five facilities (1996-)



Türk-AY SR facility

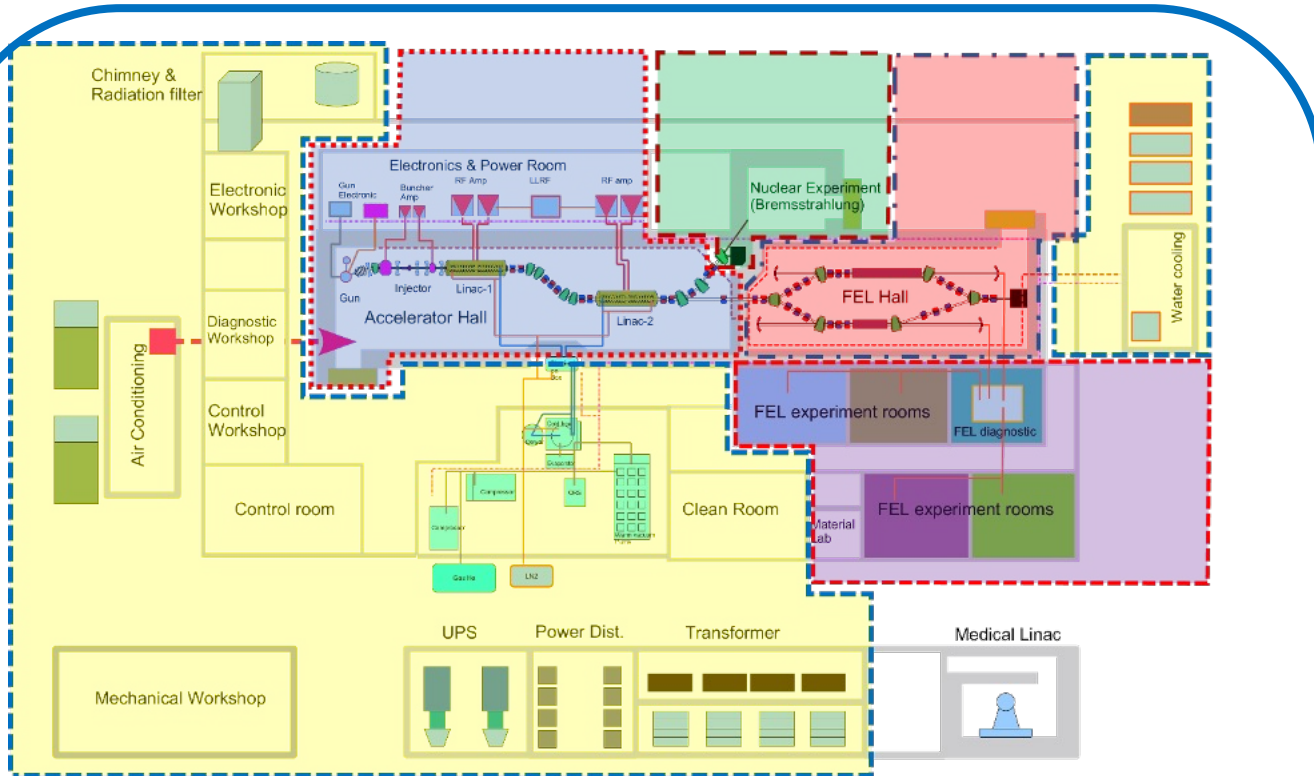
In the framework of Turkish Accelerator Center Project



Establishment of Turkish
National SR Users
Group.
Meetings in 2011, 2012.

Turkish Accelerator Research Laboratory in Ankara, TARLA

First accelerator facility of the Turkish Accelerator Center Project officially started in 2012.



Free Electron Laser producing Infrared radiation and a Bremsstrahlung facility using electrons accelerated up to 40 MeV by superconducting linear accelerators.



A. Aksoy and the TARLA team ca. 40-50 scientists

We are looking for an accelerator physicist/engineer as new project leader.

Photoelectron Spectroscopy Beamline @SESAME (TXPES)

Turkey is committed to building a photoelectron spectroscopy beamline T-XPES, on the undulator source UE56 APPLE II from BESY II. A 2nd branch for the HESEB beamline.

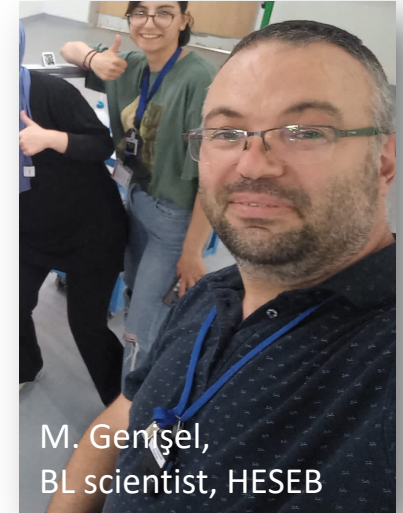
HESEB Consortium:



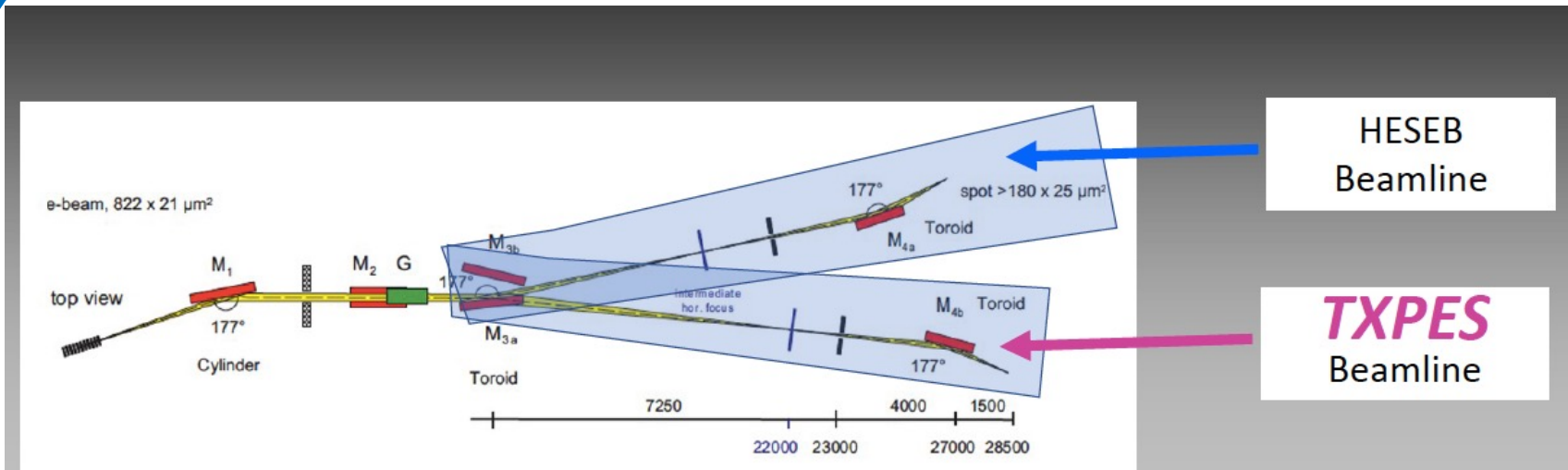
Turkish Consortium:



KOÇ
UNIVERSITY



M. Genişel,
BL scientist, HESEB



1st HESEB Workshop in Istanbul
8-9 September 2022.

Accepting post-deadline registration.

Contact A. Laussi

https://events.hifis.net/e/HESEB_in_Istanbul

Effects on Industrial Infrastructure in Türkiye

At this point we can only talk about ripple effects of CERN.

Companies that enter tenders and got orders.

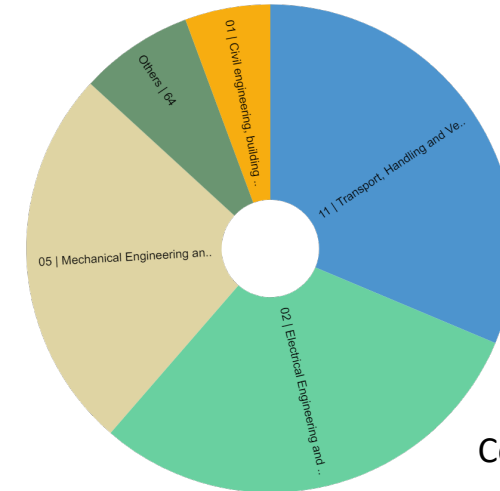
İhale Alanlar		
• Ankara	Dora Makina	Özel Alaşımlardan Mekanik Parçalar (Montajlı ve Montajsız)
• İstanbul	Albaksan	Özel Bakır Parçalar, Hızlandırıcılarda kullanılan Montajlı Soğutma diskleri
• Kayseri	Gözüküçük Makina (Kadın Girişimci)	Özel Alaşımlardan Mekanik Parçalar (Montajlı ve Montajsız)
• İstanbul	ASAŞ Alüminyum	Avrupa da temini zor ebatlarda ve hassasiyetlerde özel alaşım Alüminyum tüpler
• İstanbul	Mistel Kablo (Kadın Girişimci)	Elektrik Bağlantı ve Topraklama elemanları
• İstanbul	EGE / GEMA Endüstriyel Kontrol	Hassas Akış özellikli kontrol valfleri
• Kocaeli	Mapsis Havacılık (Kadın Girişimci)	Özel Alüminyum Alaşımdan büyük ebatlı Mekanik Parçalar
• Kocaeli-Kayseri	DoğaCAN / CryoCAN Basınçlı Kaplar	Sıvı Azot Soğutma Tankı, kontrol Sistemleri ve Bağlantı sistemleri (Yerinde montaj ve test)
• İstanbul	Ford – Otosan	65 adet CERN Kampüsünde kullanılacak personel taşıma araçları
• Manisa	HMS Makina	Özel Alaşımlardan Mekanik Parçalar (Montajlı ve Montajsız)
• Manisa	TORA Makina	CERN de uzun yıllardır kullanımda olan eski kalıpların yeniden işlenmesi, yenileştirilmesi
• Ankara	GES Mühendislik	Özel Alaşımlardan Mekanik Parçalar (Montajlı ve Montajsız)
• Ankara	OKURSOY AŞ	ATLAS Deneyinde kullanılacak Özel Alüminyum Plakaların işlenmesi
• Bursa	ÇİMTAŞ Hassas İşleme	Özel Alaşımlardan Mekanik Parçalar (Montajlı ve Montajsız)
• İstanbul	2M Kablo	Radyasyona Dayanıklı Özel CERN isterlerine göre hazırlanmış Kablolar
• Denizli	Aysan Raf Sistemleri	CERN Malzeme Ofisi – Sabit Raf Sistemleri
• İstanbul	MTN Plastik ve Kalıp	Özel Plastik parçaların Tasarım, Kalıp ve Parça imalatı
• Bursa	Mavi Jet	Su Jeti Takım Tezgâhı (CERN Mekanik Atölyesinde Kullanılmak üzere)
• İstanbul	AYVAZ	Hızlandırıcılarda kullanılan Özel Metal Körük ve Esnek Metal Borular
• Kocaeli	Sönmez Trafo	Hızlandırıcılarda kullanılan Bobin ve Magnetler
• Bursa	Mertay Metal Sac Makina	Mekanik Parça ve Hassas İşleme
• Ankara	Visan Ving	38 adet Overhead Crane / Tavan Vinci
• İstanbul	Standart Pompa	CERN 3+2 Yıllık Doğrudan Santrifüj Pompa Tedarikçisi
• İstanbul	SAMM TEKNOLOJİ	CERN 3 Yıllık Doğrudan Fiber Optik Kablo ve Konnektörlerin Tedarikçisi
Doğrudan alım ile CERN'e giren Firmalarımız		
Bursa	Figa Bara (Kadın Girişimci)	Elektrik Bağlantı Elemanları
İstanbul	Tufan Demir Çelik	CERN isterlerine göre hazırlanan özel malzemeler
Kocaeli	SimPRO	CMS Deneyinde kullanılan elektronik kartlar
CERN Deneylerine Büyük İşler Yapan Firmalarımız		
Bursa	M.F. K. Makina Freze Kalıp Ltd. Şti	CMS Deneyinde kullanılan devasa mekanik aksamlar
İstanbul	EAE Machinary	CMS Deneyinde kullanılan devasa mekanik aksamlar

Last 6 years:

245 companies participated in calls for tender. 29 got more than 100 orders. ~ 10 M CHF volume.

Participation fields have become more diverse.

- 11 | Transport, Handling and Vehicles
- 02 | Electrical Engineering and magnets
- 05 | Mechanical Engineering and raw materials
- Others
- 01 | Civil engineering, building and technical services



Courtesy of H. Kızıltoprak

Lessons Learned

Türkiye SESAME relations have been successful because of the participation and commitment of scientists and high-level government officials in the project from early on. The project attracted strong institutional ownership in the country.

The strong sense cooperation with Middle Eastern members and observer countries helped build a sense of collegiality, confidence and teamwork, as well as a feeling of accomplishment.

Ripple effects on the advanced technology infrastructure in the country can be seen in the CERN example.

SESAME was very useful for Turkish Science because through its international network it helped to establish scientific/research priorities that were different from economic growth priorities of the state such as technological adaptation for manufacturing.

Similarly, SESAME's scientific and research effects have provided a transferable model for bringing world class science to the whole region.

Thank You